Chapter 3

Solid Waste Management
Privatization Procedural Manual

Solid Waste Financial Management

Solid Waste Technical Assistance

Ministry of State for Environmental Affairs

Egyptian Environmental Policy Program

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INTRODUCTION

FINANCIAL MANAGEMENT IN THE SOLID WASTE SECTOR

If a local government does not know its true costs of collecting and disposing of solid waste, how can it effectively evaluate any financial proposal from a private sector bidder for the services?

As Egypt's Governorates and municipalities focus more attention and resources on improving solid waste management (SWM), the importance of sound financial management within the overall solid waste management effort becomes crucial. Scarce monetary resources to pay for this improvement will have to be carefully mobilized and efficiently utilized. Whether or not Governorates choose to improve solid waste management by upgrading existing internal capacity, or by contracting with the private sector, effective financial management plays an important role.

Ensuring that sound financial management practices are incorporated into the overall municipal solid waste management structure is critical for local governments. If a local government is considering contracting with the private sector for municipal solid waste collection and disposal services, good financial management practices become important in the context of dealing and negotiating with the private sector.

If a local government decides to continue self-managing solid waste services, good financial management will create practices that should translate into more effective collection services, cleaner cities, and satisfied citizens.

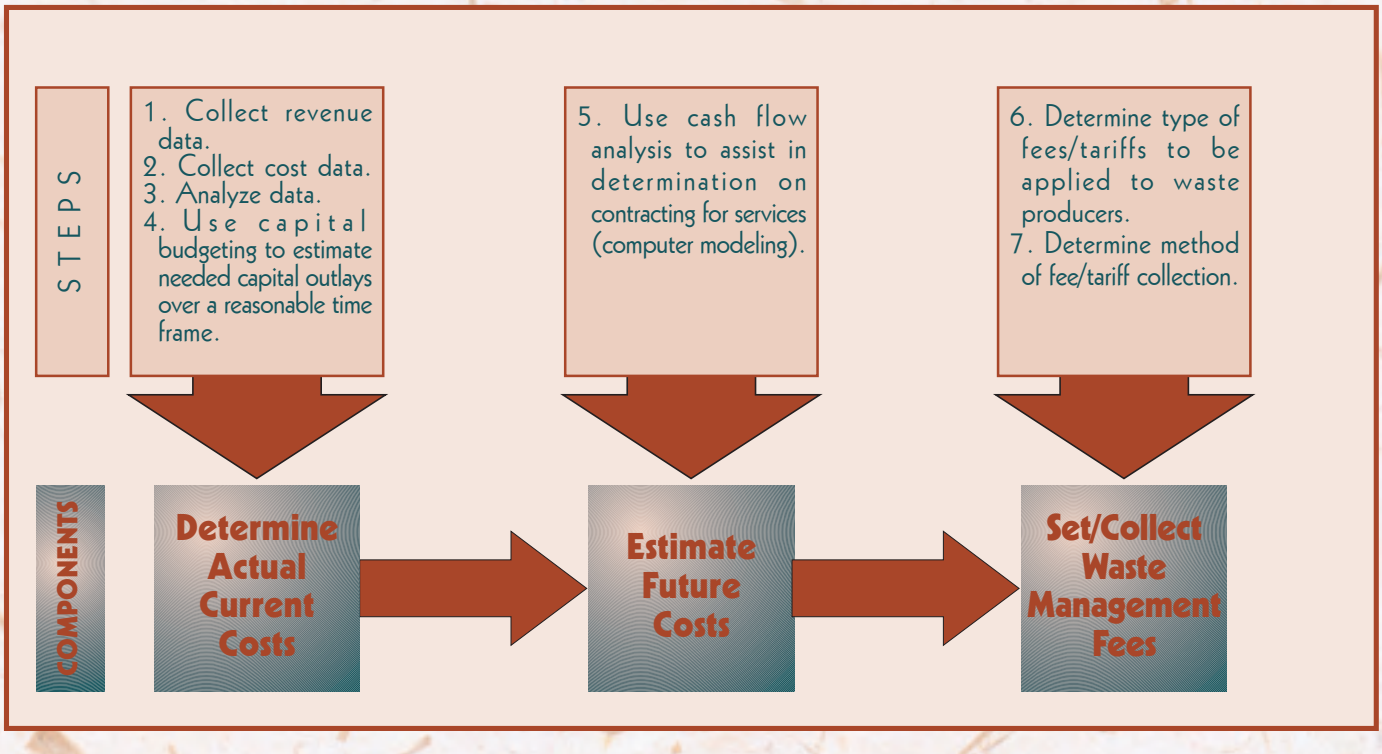
Financial management can be described as a cyclical resource allocation process. The process has three principal components:

- Determine actual current costs.
- Estimate future costs.
- Set and collect solid waste management fees.

Because the operational environment and resultant costs are always changing, this process will need to be repeated on a regular annual or bi-annual schedule. And once it determines actual costs, the operator must again estimate future costs and plan for tariff/rate changes to accommodate any changes.

Figure 3.1 shows these three components and the associated steps for developing a financial management system for solid waste management.

FIGURE 3.1: FINANCIAL MANAGEMENT PROCESS



A current "best practice" in the solid waste management field is the use of Full Cost Accounting (FCA). FCA is defined as: "...a systematic approach for identifying, summing, and reporting the actual costs of solid waste management. It takes into account past and future outlays, overhead (oversight and support service) costs, and operating costs."[1]. The seven steps presented in this chapter show how to use FCA to develop and operate a financial management system.

Historically, local governments have used cash flow accounting methods (cash basis or general fund accounting) to reflect the flow of financial resources, both income and expenses. A cash flow accounting system records income and expenses when they occur. For example, the purchase of a collection truck would be recorded as one expense on the date the truck was purchased, and income from service fees would be recorded as it is received from customers. FCA, on the other hand, is an accrual system of accounting that recognizes costs as resources are used or committed, regardless of when money is spent. Using the previous example of the purchase of a collection truck, FCA recognizes that the truck, as a resource, will not be used up in the year purchased. Rather, it will have a useful life of many years. As a result, the expense of the truck will be spread out over those years of service (depreciated). A critical concept inherent in FCA systems is the differentiation of the terms outlay and cost. **Outlay** refers to the actual expenditure of monies for the purchase of an asset or the payment for services. **Cost** refers to the monetary value of resources as they are used or expended. In the above example, the outlay for the vehicle is the price paid to acquire the vehicle. The cost of the vehicle will be the annual depreciation applied against its value.

Similarly, gross billings of rates (not actual receipts of money) would be recognized as income under FCA rules. Persons or companies that didn't pay their rates would be reflected under a separate account in the system.

This chapter is not meant to be an accounting guide. As such, it will not provide and describe charts of accounts or posting procedures. That is the job of the local government or Governorate seeking to upgrade accounting systems. What this chapter will do is guide the user through the various steps of organizing data for analysis and interpretation. Whether a Governorate seeks to privatize solid waste management services or not, the proper organization of financial data and its analysis can assist governments to more efficiently apply scarce resources to improve the lives of citizens.

FCA requires a new way of thinking about solid waste management. The benefits of FCA are many, the most important of which are summarized below:

FCA makes it easier to identify true costs. When local governments truly know their solid waste management costs, it is easier to control them.

With FCA, "peaks and valleys" in cash expenses can be avoided. FCA employs depreciation and amortization which spreads costs out giving a more realistic picture of solid waste management programs without the distortions prevalent under cash flow accounting policies.

FCA is useful when contracting with the private sector. Because local Governorates better understand costs under FCA, they position themselves for better negotiating and decision-making with private sector operators who bid on privatization contracts. Essentially, using FCA allows a Governorate to view solid waste management operations as would a private company.

FCA is a powerful analysis tool. FCA allows municipalities to account discretely for each component of solid waste management services, so that each can be evaluated for effectiveness on its own. For example, FCA would allow analysis of a recycling operation apart from other solid waste management operations. This differs considerably from local Governorate systems that frequently use centralized costing without regard for cost center activities.

FA enables benchmarking. FCA allows municipalities to compare their performance in solid waste management against industry standards. This can be a useful evaluation tool.

FCA makes financial transparency available to Public Awareness Programs. FCA allows for accurate disclosure to citizens as part of any public awareness/education component.

[1] United States Environmental Protection Agency, Full Cost Accounting for Municipal Solid Waste Management: A Handbook, Washington, DC 1997.

STEP 1

COLLECT REVENUE DATA

The first step in upgrading information systems to FCA standards is collecting accounting data. On the revenue side, begin by listing all sources of revenue for the past year. In the Egyptian context these sources of revenue could fall into the accounts listed in Figure 3.2.

FIGURE 3.2: SAMPLE SOURCES OF REVENUE

Income Account	Description
Cleansing Tax	Tax (generally 2% of rental value of apartments) imposed and collected from residential property owners.
Transfer from General Fund	Simple transfers from the municipal general fund to the solid waste management department.
Transfer from National Government	Direct subsidy provided by the national government though the Ministry of Finance
Sales	Revenue from the sales of composted mulch, recyclables. Also includes any dumping fees collected.
Contracts	Revenue from negotiated collection contracts with large producers such as hotels, restaurants, etc.

Figure 3.3 provides an example of an organizing framework for collecting revenue data. At the start of this exercise, list only totals on the bottom line. Income can be allocated later among principal solid waste management activities as they become known.

FIGURE 3.3: EXAMPLE OF TABLE FOR COLLECTING REVENUE DATA

Activity	Income Accounts					
	Cleansing Tax	Transfer from General Fund	Transfer from National Government	Sales	Contracts	Totals
Waste Collection						
Waste Transfer						
Waste Recycling and/or Processing						
Waste Recycling and/or Disposal						
Street Cleaning						
Public Cleaning (parks, monuments, etc.)						
Totals						

STEP 2

COLLECT COST DATA

The use of FCA means recognizing many costs that would not have been recognized under a cash flow accounting system. Figure 3.4 reflects some of the costs used in a FCA system, and although not all of the costs shown may be applicable in every Egyptian context, they are noted here as a due diligence item.

In FCA, there are two different kinds of costs; Operating Costs and Capital Costs. Each is discussed in more detail in this step.

FIGURE 3.4: SAMPLE FCA COSTS

Type of Cost	Cost Components
Front-End Costs	• Public awareness and outreach programs • Land acquisition • Costs of permits • Building construction
Operating Costs	• Recurring costs - Operations and Maintenance (O&M) - Debt Service
Capital Costs	• Purchase of assets used in the course of business with life in excess of one year (subject to depreciation).
Back-End Costs	• Site Closure • Building/equipment decommissioning • Post-closure maintenance • Retirement and health benefits for current employees
Contingent Costs	• Remediation costs • Liability costs (property damage, personal injury, etc.)

OPERATING COSTS

Operating costs are recurring costs or expenses of doing business. There are generally two principal operating costs:

- Operations and maintenance (O&M).
- Debt service (interest payments on loans).

These two types of operating costs can be divided into direct and indirect categories. Direct costs are those attributable to the principal activities of running a solid waste management operation, such as waste collection, transfer station operations, landfill operations, recycling operations, etc.

Indirect costs are those incurred in support of operating activities. Examples of these costs are accounting costs, clerical staff, payroll services, data processing, insurance, etc. These kinds of costs are referred to as "overhead".

The costs of running these activities must be allocated across appropriate expense accounts. These expense accounts are listed in Figure 3.5 together with a further description.

FIGURE 3.5: OPERATING COST CATEGORIES

Expense Account	Description
Labor Wages	Wages/salaries of employees, including: the cost of employee benefits such as health insurance, retirement plans, bonuses, etc. Also includes day labor wages.
Vehicles & Equipment	Cost of operations of vehicles including: fuel, oils and lubricants, maintenance, etc. Also includes cost of lease if applicable.
Rent or Lease Payments	Rent or Lease payments. Examples of this would be amount paid for leasing land for landfill operation, transfer station, fleet garage, offices, etc.
Contract Services	Expenses of contracting for specific services such as: street sweeping, recycling, etc.
Loan Repayments	Interest payments on any loans taken out for principal solid waste management activities.
Other Payments	Any other type of payment not described above.

The activities and expense accounts in Figure 3.5 are only examples and may not cover everything needed for certain situations. With the information obtained from the data in the table, a local government can set up framework (see Figure 3.8), which allocates direct and indirect costs among appropriate financial accounts. The examples cited here are for Residential and Commercial Solid Waste Management. A local government also may want to develop similar frameworks for industrial waste, medical waste, street sweeping and public cleaning, or other waste management services as the situation applies.

The main idea is to organize expenses in a logical fashion that properly states allocated expenses among various SWM activities.

CAPITAL COSTS

The majority of assets in a SWM system usually are comprised of vehicles, equipment, land and facilities that have a useful life in excess of 1 year. Thus, the outlay (price paid) for these assets will not be recognized in 1 year, but will be spread out over the useful life of the assets. In other words, the assets will be depreciated, and each year's depreciation will constitute the asset's cost for that year. Costs for resources with useful lives in excess of 1 year are commonly called capital costs.

In Egypt, certain legal guidelines governing the depreciation of assets exist.(see figure 3.6)

An inventory of all capital cost assets must be established and maintained so that costs related to the use of these resources can be allocated properly. Figure 3.7 provides an example of an inventory format that a local government could use for this purpose. The purpose of the inventory is to separate assets that will be classified as capital assets, and subject to depreciation, from those that aren't.

FIGURE 3.6: DEPRECIATION GUIDELINE

Description	Number of Years to Depreciate
Buildings	20 - 25 Years
Machinery	10 - 15
Vehicles	10
Furniture	10
Electronics and Computers	5

FIGURE 3.7: CAPITAL ASSET INVENTORY SAMPLE

Vehicle and Equipment Inventory Framework						
Activity		Quantity	Purchased (P) or Leased (I)	Date Aquired	Amount Paid	Remaining Life
Collection	Equipment					
	Rear Compactors					
	Front Compactors					
	Trailers					
	Micro Trucks					
	Pickups					
	Motorcycles					
	Garage					
	Maintenance Shop					
Transfer Station and Transport	Front Loader					
	Back Loader					
	Pickups					
	Transfer Vehicles					
	Trailer					
	Crane					
	Scalehouse/Office					
	Land					
Recycling Operations	Recycling, Building & Machinery					
	Turners					
	Front-End Loaders					
	Other Vehicle					
	Land					
Landfill Operations	Weighing Scale					
	Water Trucks					
	Graders/Compactors					
	Dump Trucks					
	Bulldozers					
	Other Vehicles					

Note: Leased items are not capital costs.

Once the inventory of capital assets has been completed, calculate the remaining life of each asset and the annual depreciation to be allocated. For our purposes, use a straight-line depreciation method (i.e., outlay amount divided by the number of years of depreciation). Do not continue to depreciate an asset after its depreciable life is over, even if the asset continues to be utilized.

Additionally, **front-end** costs associated with setting up the solid waste management operation must be accounted for through depreciation. Front-end costs are those incurred before the project becomes operational. These costs include feasibility studies, landfill acquisition, construction costs, permitting, etc. Even though these represent outlays made prior to commencing operations, they should be shown as an annual depreciation cost during operations.

Back-end costs represent another challenge. Back-end costs are anticipated costs that will be incurred after operations cease. An example of these would be the closure of a landfill. After closure the landfill no longer is part of the operation, but there will be some costs, associated with maintaining the site. Any predictable costs that will be incurred after operations cease should be amortized during the period of operation. In other words, the future outlay is recognized as a debt and annual payments are paid into an account (amortized) so that there will be sufficient funds available to pay the debt when it "comes due".

Figure 3.8 provides an example of how a framework for data collection can be constructed along these lines.

FIGURE 3.8: OPERATING COST FRAMEWORK FOR RESIDENTIAL & COMMERCIAL SWM

ACTIVITIES		Financial Accounts						
		Labor	Vehicles Equipment	Rent/Lease Payments	Contract Services	Loan Payments	Other Payments	Totals
Direct Expenses	Collection							
	Transfer Stations							
	Transfer Vehicles							
	Landfill Operations							
	Recycling Center							
	Public Awareness Program							
	Monitoring Unit							
	Sub-total							
Indirect Expenses	Accounting							
	Billing							
	Building Operations							
	Clerical Activities							
	Communications							
	Data Processing							
	Insurance							
	Legal							
	Payroll							
	Personnel							
	Purchasing							
	Other							
	Sub-total							
	Total							

Allocating indirect costs can be a bit trickier than direct costs. If the indirect costs (overhead) are exclusive to the solid waste management effort, then they should be allocated among the various cost centers based on the percentage of time/resources devoted to each cost center (or some other equitable allocation system).

If, however, indirect costs are shared with other municipal functions, then those portions attributable only to solid waste management must be determined, and then allocated amongst the cost centers. For example, if payroll operations costs also cover other municipal departments, then the portion to be allocated to the solid waste management operation must be calculated. The simplest method to do this is known as the Budget Share Method, and it is calculated by dividing the solid waste management annual budget by the total local government annual budget less total shared costs. The result of this is known as the allocation multiplier. An example is shown on this page.

SWM Annual Budget ÷ Total Municipal Budget less shared services = Allocation Multiplier

For example, assume that a municipality has a total annual budget of LE 100 million. The budget for the SWM department (or Beautification Authority) is LE 30 million. The total amount of shared services and resources amounts to LE 10 million. The allocation multiplier is calculated as follows:

LE 30 million ÷ (LE 100 million – 10 million) = 0.33

Thus, the SWM share of the shared cost would be LE 10 million x 0.33, or LE 3.3 million.
This amount would then be allocated proportionally among the various SWM cost centers.

STEP 3

COLLECT OPERATIONAL DATA

After organizing accounting data, a Governorate needs to gather operational data. Operational data refers to specifics regarding the service area falling under the SWM system. They should include details such as demographics, units serviced, neighborhood growth rates, waste collected, etc. Once these data are accurately collected and maintained, they can be used together with SWM costs to further develop discrete operation factors. Ideally, these operational data could be represented as in Figure 3.9.

FIGURE 3.9: EXAMPLE OF HOW TO ORGANIZE OPERATIONAL DATA FOR RESIDENTIAL SOLID WASTE COLLECTION SERVICE

Operational Data : Residential Solid Waste Collection					
Neighborhood	Number of Households	Avg. Annual Household Income	Avg. Annual Waste Produced (in m^3)*	Collection Method (door-to-door, pooling site, etc.)	Collection Frequency (daily, weekly)

* m^3 = cubic meters

Once data such as the example above are collected and updated, the Governorate has a wealth of operational and demographic data. For example, it will be able to estimate future waste volumes based on predicted population growth and correlate waste production against household income to more efficiently allocate service vehicles, and plan capital expenditures.

Figure 3.10 shows an example of organizing operational data for commercial service.

FIGURE 3.10: EXAMPLE OF ORGANIZING OPERATIONAL DATA FOR RESIDENTIAL SOLID WASTE COLLECTION SERVICE

Operational Data : Commercial Solid Waste Collection						
Neighborhood	Number of Commercial Shops	Type of Shop	Avg. Annual Gross Sales	Avg. Annual Waste Produced (in m^3)*	Collection Method (door-to-door, pooling site, etc.)	Collection Frequency

* m^3 = cubic meters

These kinds of data should be collected and maintained for all aspects of solid waste management. Chapter 2 has information on additional data that should be collected.

All of the collected data can then be used to further refine operational factors for the SWM department. The list below shows various indicators that can be produced:

- Crew size per collection vehicle, by neighborhood.
- Vehicles needed per number of residences and/or shops, by neighborhood.
- Fuel cost per vehicle per year.
- Maintenance costs per vehicle per year.
- Fuel and maintenance costs per vehicle hour of operation.
- Laborers per kilometer (km) of street for manual street sweeping.
- Km per day of street per street sweeping machine.

STEP 4

ANALYZE DATA

Thorough data collection practices coupled with FCA systems allow local governments to do the following:

- Prepare sound budgets that stand up to scrutiny and questioning.
- Pinpoint inefficiencies or other problems within discrete cost centers.
- Compare their own financial results/ratios with those of other countries or against other Egyptian local governments.

In the end, good financial analysis is only possible with good financial accounting. The results of financial analysis serve as a tool to improve efficiencies, eliminate waste, improve service to citizens, and lower costs. Figure 3.11 contains some cost and operational benchmarks for solid waste management.

FIGURE 3.11: SAMPLE BENCHMARKS FOR ANALYSIS

Costs of Municipal Solid Waste Management: A Comparison (1988 $)					
		Basis	**Low-Income Country**	**Middle-Income Country**	**Industrialized Country**
Collection	S.W. Generated	tons/capita/year	0.2 tons	0.3 tons	0.6 tons
	Collection cost	$/ton	$15-30	$30-70	$70-120
	Collection cost	$/capita/year	$3-6	$9-21	$42-72
	Collection cost	% of per capita income	0.9-1.7%	0.5-1.1%	0.2-0.4%
	O&M* cost	% of total cost	45%	30%	20%
	Labor cost	% of total cost	15%	40%	70%
	Capital cost	% of total cost	40%	30%	10%
Public Cleansing	Collection cost	$/ton	$30-60	$60-140	$140-240
	Collection cost	$/capita/year	$0.6-1.2	$1.8-4.2	$4.2-7.2
	Collection cost	% of per capita income	0.2-0.3%	0.1-0.2%	0.02-0.04%
	O&M* cost	% of total cost	20%	10%	10%
	Labor cost	% of total cost	50%	70%	65%
	Capital cost	% of total cost	30%	20%	25%
Sanitary Landfill	Disposal cost	$/ton	$1-3	$3-10	$15-50
	Disposal cost	$/capita/year	$0.2-0.6	$0.9-3.3	$9.0-30.0
	Disposal cost	% of per capita income	0.05-0.2%	0.05-0.2%	0.05-0.2%
	O&M* cost	% of total cost	35%	30%	25%
	Labor cost	% of total cost	10%	20%	35%
	Capital cost	% of total cost	55%	50%	40%
Transfer System	Transfer cost	$/ton	$3-5	$5-15	$15-20
	Transfer cost	$/capita/year	$0.62-1.0	$1.5-4.5	$9.0-12.0
	Transfer cost	% of per capita income	0.2-0.3%	0.1-0.2%	0.05-0.07%
	O&M* cost	% of total cost	25%	25%	20%
	Labor cost	% of total cost	10%	25%	45%
	Capital cost	% of total cost	65%	50%	35%

Source: Cointreau-Levine, Sandra Private Sector Participation in Municipal Solid Waste Services in Developing Countries (Vol. 1), The World Bank, Washington, DC 1994.
*O&M = Operations and Maintenance

STEP 5

USE CAPITAL BUDGETING TO ANTICIPATE FUTURE CAPITAL EXPENDITURES

Capital budgeting is the process of anticipating capital expenditures at future dates and planning for the outlay. A simple example is shown in Figure 3.12.

A municipality owns a fleet of nine collection trucks. They were all purchased at the beginning of year 1 at an outlay of LE 250,000 each for a total of LE 2,250,000. This fleet is capable of servicing collections for 30,000 residences. The size of the municipality at year 1 is 27,000 residences.

The city is growing at 3 percent per year, so that at the end of the fourth year; there will be almost 30,300 residences. That means that one additional collection vehicle needs to be purchased in year five. Inflation at 4 percent per year, however, will have pushed up the price of these vehicles to LE 292,465. Population growth will continue to require new vehicle purchases in years 8 and 11. Additionally, the vehicles have a depreciable life of 10 years, so at the end of year 10, all the vehicles purchased at year 1 will need replacement. Inflation will have driven up the price of these vehicles to LE 370,000 for a total outlay needed of LE 3,833,837 at the beginning of year 11 (replacement of the nine original vehicles plus one vehicle due to growth).

FIGURE 3.12: EXAMPLE OF COLLECTION VEHICLE CAPITAL BUDGETING

Budgeting period	11 years
Depreciation period	10 tears
Annual household formation growth rate	3%
Inflation rate	4%
Number of households year	27,000
Ratio of collection vehicles to households	1:3,000

Based on the information in the example, Figure 3.13 shows how a table can be constructed to show capital outlays and costs.

FIGURE 3.13: CAPITAL BUDGETING TABLE

		Depreciation										
Yr	**Outlay**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	2,250,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
2												
3												
4												
5	292,465					29,247	29,247	29,247	29,247	29,247	29,247	29,247
6												
7												
8	328,983								32,898	32,898	32,898	32,898
9												
10												
11	3,833,837											383,384
Tls.	6,750,000	225,000	225,000	225,000	225,000	254,247	254,247	254,247	287,145	287,145	287,145	445,529

Manually, this process can become very complex when dealing with numerous depreciable items. Personal computers and spreadsheet programs, however, can facilitate this type of planning. The local government will need to execute this type of budgeting for all capital assets. Generally, budgeting should not exceed 10 to 11 years as forecasting beyond that becomes problematic and error-prone.

Once a capital budgeting plan is completed, it will play an important part in forecasting cash flows and setting solid waste tariffs/fees.

STEP 6

USE CASH FLOW ANALYSIS FOR DECISION-MAKING

Once a Governorate has gathered the accounting data needed to accurately reflect its revenues and true costs, and has completed a capital budgeting exercise, it is ready to begin the process of preparing forecasts of its revenues and expenditures (also known as preparing pro forma income and expense statements). These will be needed to accurately set user fees (tariffs, or cost of service fees).

The following is a step-by-step construction of a simple cash flow model that will represent a pro forma statement for an imaginary local government in Egypt. Microsoft Excel, a spreadsheet program for personal computers, will be used. Apply the same assumptions used in the capital-planning model and add a few more as well. This example will demonstrate the process for residential solid waste collections. This same exercise would have to be performed for all of the other components of a solid waste management system in order to consolidate all data into one integrated cash flow statement.

BUILD OPERATIONAL FORECAST MODEL

We begin by building an operational forecast "model" that sets out the underlying drive factors for our financial statements.

All the calculations in Figure 3.14 take into account population growth (changes in fleet size) and inflation (changes in wages and maintenance expenses). Note that if good operational data are available related to the collection service area, a more accurate "volumetric" modeling approach can be utilized to forecast equipment needs (fleet size/crew size). For our purposes now, however, we make use of a simpler assumed ratio of vehicles to residences.

FIGURE 3.14: UNDERLYING ASSUMPTIONS DRIVING THE MODEL

Annual inflation rate:	4%
Annual household formation growth rate:	3%
Number of households in service area:	27,000
Households per collection vehicle:	3,000
Crew size per collection vehicle (non-driver):	3
Wages for crew (including benefits)/day:	20
Wages for driver (including benefits)/day:	24
Overhead rate (% of total labor):	20
Hours of operation per day per vehicle:	10
Fuel and maintenance cost per hour:	30
Collection frequency (times per week):	6

CREATE INCOME AND EXPENSE STATEMENT

Next, migrate these data over to an income and expense statement, samples of which are provided in Figures 3.15 and 3.16.

Notice that because we are looking at this exercise from the government viewpoint, no profits are built in to the cash flows. Essentially, the government wants to break even, that is, take in revenues to match expenses. That is why it is critical that accurate expense numbers be generated. Note too, that revenues were forecasted over the cash flow period. Cleansing taxes and transfers from the national government were the assumed constant sources of income and these were inflated over time. This makes the exercise of setting tariffs fairly simple in the sense that the gross total of tariffs needed to sum revenues to equal expenses can be calculated. Arriving at required gross tariffs is the first goal of tariff setting. This basis of presentation is also called a cash needs basis, and is frequently used by municipal-owned SWM operations.

FIGURE 3.15: SAMPLE INCOME AND EXPENSE STATEMENT

	Base Year	1	2	3	4	5	6	7	8	9	10	11
Number of households	27,000	27,810	28,644	29,504	30,389	31,300	32,239	33,207	34,203	35,229	36,286	37,374
Number of vehicles	9	9	9	9	10	10	10	11	11	11	12	12
Number of drivers	9	9	9	9	10	10	10	11	11	11	12	12
Number of crew	27	27	27	27	30	30	30	33	33	33	36	36
Labor expense-drivers	67,392	70,088	72,891	75,807	87,599	91,103	94,747	108,391	112,726	117,235	133,009	138,329
Labor expense-crew	168,480	175,219	182,228	189,517	218,998	227,757	236,868	270,977	281,816	293,088	332,522	345,823
Vehicle maintenance expense	842,400	876,096	911,140	947,585	1,094,988	1,138,787	1,184,339	1,354,883	1,409,079	1,465,442	1,662,610	1,729,115

FIGURE 3.16: SAMPLE INCOME AND EXPENSE STATEMENT FOR GOVERNMENT OPERATION

INCOME	1	2	3	4	5	6	7	8	9	10	11
Cleansing Taxes	223,274	230,765	238,556	270,065	284,107	293,844	330,299	347,148	359,196	401,343	4490,900
Transfer from National Govern.	300,000	312,000	324,480	337,459	350,958	364,996	379,596	394,780	410,571	426,994	444,073
RequiredUser fees (Tariffs)	872,190	899,518	927,938	1,080,380	1,140,602	1,177,683	1,354,476	1,427,747	1,475,208	1,680,056	1,870,652
Total Income	1,395,465	1,442,285	1,490,977	1,687,907	1,1775,671	1,836,529	2,064,378	2,169,682	2,244,984	2,508,402	2,755,637

EXPENSES	1	2	3	4	5	6	7	8	9	10	11
Labor (including benefits)	245,307	255,119	265,324	265,324	318,860	331,615	379,367	394,542	410,324	465,531	484,152
Administration (overhead)	49,061	51,024	53,065	53,065	63,772	66,323	75,873	78,908	82,065	93,106	96,830
Fuel and maintenance	876,096	911,140	947,585	947,585	1,138,787	1.184,339	1,354,883	1,409,079	1,465,208	1,662,610	1,729,115
Depreciation	225,000	225,000	225,000	225,000	254,247	254,247	254,247	287,145	287,145	287,145	445,529
Total espense	1,395,464	1,442,283	1,490,974	1,490,974	1,775,666	1,836,523	2,064,371	2,169,674	2,244,975	2,508,392	2,755,626

Notice that the above calculations show no debt service or any other entry that would indicate that capital outlays were utilized at the beginning of the cash flow period, again at year 9, and finally at year 11. In this case, it is assumed that the national government simply paid for the vehicle fleets at all points in time, a 100 percent subsidy. If the national government were unable or unwilling to do this (and that may be a likely scenario in the future), then the government would have to find other sources to raise capital. One way would be to borrow, but many local Governorates in Egypt have no credit standing and would be unable to secure financing. The other way would be to raise user fees/tariffs for the years the capital is needed. Again, this is an unlikely scenario, as the amounts needed would be large and the tariff burden would be onerous and politically explosive. This is a major reason why more local governments are turning to the private sector to contract for solid waste management services. Let's now look at how a private operator might approach the issue.

DEVELOP "UTILITY BASIS" FOR CALCULATING TARIFFS

We need to construct the pro forma statement from the perspective of a private company that has shareholders funding its operations. This is also known as the utility basis for calculating tariffs.

For this example, assume that a private operator funds its capital requirements entirely from shareholder equity. If the shareholders are expecting a 20 percent return on their investment, then the SWM operation must generate a positive net income that accomplishes this requirement. Let's look at the pro forma statement after making these changes. (See Figure 3.17).

Note that the cash flow goes out only 10 years. The reason for this is to anticipate a private operator decision not to enter into any contract with a municipality that would require major new capital outlays soon before termination of the contract. Thus, if the majority of the assets depreciate out after 10 years, one might expect a contract proposal from the private sector for that term as well. In this case, at the end of 10 years the local government would tender another contract for a similar period of time, or take over operations on its own.

Using these two examples, the cost to the government will be higher if a private operator is contracted to manage the SWM operations. The reason for this is cost of capital, the price the private operator must pay for borrowing money to purchase the vehicle fleet (in this case, borrowing from shareholders). For these examples, we've assumed operating costs to be the same in both cases.

FIGURE 3.17: INCOME AND EXPENSE STATEMENT FOR PRIVATE OPERATION

Pro Forma Income and Expense Statement: Private Operator/Shareholder Funded

INCOME	1	2	3	4	5	6	7	8	9	10
Cleansing Taxes	223,274	230,765	238,556	270,065	284,107	293,844	330,299	347,148	359,196	401,343
Transfer from National Govern.	300,000	312,000	324,480	337,459	350,958	364,996	379,596	394,780	410,571	426,994
RequiredUser fees (Tariffs)	1,322,190	1,349,518	1,377,938	1,530,380	1,649,095	1,686,176	1,862,969	2,002,036	2,049,498	2,254,346
Total Income	1,845,465	1,892,285	1,490,977	1,687,907	2,284,164	2,345,022	2,572,871	2,743,972	2,819,274	3,082,692

EXPENSES	1	2	3	4	5	6	7	8	9	10
Labor (including benefits)	245,307	255,119	265,324	265,324	318,860	331,615	379,367	394,542	410,324	465,531
Administration (overhead)	49,061	51,024	53,065	53,065	63,772	66,323	75,873	78,908	82,065	93,106
Fuel and maintenance	876,096	911,140	947,585	947,585	1,138,787	1.184,339	1,354,883	1,409,079	1,465,208	1,662,610
Depreciation	225,000	225,000	225,000	225,000	254,247	254,247	254,247	287,145	287,145	287,145
Total espense	1,395,464	1,442,283	1,490,974	1,490,974	1,775,666	1,836,523	2,064,371	2,169,674	2,244,975	2,508,392

	1	2	3	4	5	6	7	8	9	10
Net Income	450,001	450,002	450,003	450,004	508,498	508,499	508,500	574,298	574,299	574,300
Shareholder equity	2,250,000	2,250,000	2,250,000	2,250,000	2,250,000	2,542,465	2,542,465	2,871,448	2,871,448	2,871,448

What these examples don't show is that private operators may incur lower costs than the government-run operation, if they run a more efficient operation than the government. If this is the case, the costs for private operation may be closer to or even less than the costs for a government-run operation.

It is commonly said that local governments should seek private sector participation in their municipal services because the private sector is "more efficient and can do the same job more efficiently and cheaply". This may or may not be true. If a local government is disorganized and mismanaged, then the private sector could likely do a better job and at a lower price. But, if the government runs a well-organized and managed solid waste operation, then there is no reason to believe that the private sector would be so much more effective as to force a shift in management.

The more important fact is that the private sector is much more efficient and effective in its ability to raise capital. National government resources, especially in developing countries, are becoming scarcer. Local governments are often stretched to the limit financially and are unable to tap into credit or capital markets unless they have outstanding credit ratings or unless a sovereign guarantee accompanies their loan application at a bank. Again, this is becoming a rare scenario indeed. Thus, faced with the prospect of vastly scaled down SWM programs, or no program at all, more and more local governments are turning to the private sector.

This section has explained how to present financial data—forecasted into the future—from two perspectives: a municipal and a private operator. Now, a local government can use the data to make some decisions.

Based upon the pro forma statement shown above, the operator has forecasted his expenses inclusive of inflation and growth, has accounted for depreciation, and has tailored capital funding through the sale of equity shares. The operator will require a payment from the local government each year that equals the line item titled "Total Income". This will cover his expenses and yield an amount sufficient to achieve a 20 percent return to shareholders.

If the local government is incapable of raising the funds necessary to purchase the vehicles, its only option may be to pay the higher annual costs (fees) to the private operator. The local government will now have to determine how it will raise these fees.

STEP 7

DETERMINE TYPES OF FEES/TARIIFS

FLAT RATES

There are numerous methods available to set rates or user fees. The easiest is to simply divide the total fees required by the number of users to arrive at a flat rate. While simple, this method is inequitable; burdening poorer ratepayers with the same fees as wealthy ones. A flat rate system is one that charges one rate, irrespective of the amount of trash set out for collection (i.e., a rate payer would pay the same for 3 cubic meters of trash collected as for 10 cubic meters). Thus, a flat rate system is inequitable for two reasons: it does not differentiate between households and businesses with respect to income, and it is insensitive to the amount of trash disposed.

To improve the equity of a flat fee structure, a local government may wish to develop one that makes use of detailed demographic data in terms of income and household size. One method of accomplishing this is to conduct what is known as a "willingness to pay" survey. The survey is set up to sample households in representative neighborhoods and collect income data. The goal of the survey is to develop a correlation between income, household waste generated, and a tariff amount that the household would be willing to pay.

A "Willingness to Pay" survey can also serve as an excellent tool for determining service options when planning SWM systems.

Once the correlation is established, rates can be set for neighborhoods where general income data are known without too much fear of delinquency and non-payment.

In the absence of good survey data, Governorates or local government can set up computer models and base rates on some other underlying correlation. For example, studies have shown some correlation between electricity usage and income. In a residential context the correlation is strong, and less so for commercial and industrial settings. Given this correlation, rate requirements can be spread among electricity customers based on estimated equity burdens. The Governorate of Alexandria is using this method to calculate tariffs and other Governorates are planning to follow.

Assume that a local government decides to award a contract to a private operator. Using the example from Figure 3.17, the required annual revenue from user fees (tariffs) will be LE 1,322,190 for the first year of the private operator's contract. But, is this the amount that the local government will need to bill users? In order to achieve target collection rates from ratepayers, local governments may need to "gross up" required billing amounts to account for anticipated non-payment problems. For example, if 10 percent of billings are going unpaid, then this amount is calculated and added to the gross billings. Essentially, this type of system transfers the delinquency burden to regular payers. If we know that the annual contract amount due to the private operator is LE 1,845,465 (first year), and if we also know that cleansing taxes and a government subsidy will be a part of our revenue source, then we can more accurately determine a billing target.

From the pro forma statement, (Figure 3.17) we can see that we will collect LE 523,274 in revenues from the national government and from cleansing taxes. That leaves LE 1,322,190 to be collected from ratepayers. However, if we estimate that 10 percent of ratepayers will not make their payments, and if we further assume that the Electricity Corporation will charge a fee for their collection services, then we need to gross up our collection target to account for these costs (the collection fee was not previously included in the cost section of the proforma statement). To determine the gross tariff billings required, use the formula shown in Figure 3.18.

Figure 3.19 shows the results of a simple model that derives these numbers:

FIGURE 3.18: GROSS TARIFF BUILDINGS FORMULA

$$\frac{\text{Net Tariff Collection Required}}{1 - (\text{Uncollectables} + \text{Collection Fees})} = \text{Gross Tariff Billings Required}$$

THUS

$$\frac{1{,}322{,}190}{1 - (0.10 + 0.03)} \quad \frac{1{,}322{,}190}{0.87} = 1{,}519{,}760$$

FIGURE 3.19: ESTABLISHING COLLECTIBLE TARIFFS

Total Revenue Required	**1,845,465**	
Annual Tariff Revenues Generated	Elec. Corp. Fees	3%
	Uncollectible %	10%
Cleansing Taxes	223,274	
Other Income Source	---	
Government Subsidy	300,000	
Total Constant Revenues	523,274	
Net Tariff Collections Required	1,322,191	
Fees and Uncollectibles	197,569	
Gross Tariffs Billings Required	**1,519,760**	

FIGURE 3.20: SAMPLE TARIFF SCHEDULE

		Calculated Amounts		
Category	**Number of Users**	**Burden Distrib.**	**Monthly Tariff**	**Annual Revenue**
1-50 kwh	7,019	10%	**1.80**	151,976
51 -200	12,221	30%	**3.11**	455,928
210-350	5,133	27%	**6.66**	410,335
351-650	1,877	17%	**11.47**	258,359
651-1000	373	5%	**16.96**	75,988
>1000	375	11%	**37.11**	167,174
	27,000	100%		1,519,760

The figures in Figure 3.19 lead to the tariff schedule shown in Figure 3.20. The schedule to collect this amount was determined by spreading ratepayers among electricity consumption categories. Then, a "burden" was assigned to each category.

The burden distribution column in Figure 3.20 shows the percentage each category pays of the local amount. In this example, the 7,019 users in the lowest category would pay 10 percent of the total amount, and the 375 users in the highest category would pay 11 percent of the total amount, or LE446 per year.

Of course, this shows the tariffs for the first year. Tariffs would have to be increased each year to match the contract amount from the operator. Alternatively, annual contract payments could be averaged, allowing a tariff calculation that wouldn't need to be increased for a number of years.

This method of calculating fees relies heavily on subjective judgment as to affordability/willingness to pay levels but if good demographic data are unavailable, this may be the best method to use. If willingness to pay data are available, using this system together with the survey results should produce highly equitable and balanced tariff schedules.

VARIABLE RATE SYSTEMS

If a Governorate collects good data on volume of waste collected and hauled, variable rate fee systems may offer some additional equity not found in flat rate systems. A variable rate system is one that charges waste producers based on the weight or volume of the waste collected. Also known as "pay as you throw" fee systems, they create incentives to reduce waste.

In the Egyptian context, pay as you throw systems would be highly desirable for large waste producers such as factories, hotels, and large commercial establishments. Indeed, Governorates contemplating privatizing their SWM operations should ask for this type of proposal with respect to these types of waste generators. Under this system, a variable fee would be negotiated with the waste generator in advance. The large amount of waste they generate makes it relatively easy to calculate volumes collected and to derive a billing.

Residential variable waste fee systems are generally more difficult to administer and require vigorous enforcement efforts. At this time, a variable rate system for residential collections would likely prove unfeasible in Egypt. Various options are being used in more developed countries and some of these are briefly summarized in Figure 3.21 along with pros and cons for each.

FIGURE 3.21: PROS AND CONS OF VARIABLE FEES SYSTEM OPTIONS

System Option	Pros	Cons
Variable Can System: Customers are billed on the number and/or size of trash cans set out.	No bags required; Less film plastics enter waste stream.	More cumbersome than bags; Costly to set up and maintain collection system.
Prepaid Bag System: Customers purchase special garbage bags with logos. The price of the bag includes the costs of collection and disposal.	No billing system needed; Bag size can be regulated insuring equitable service for all customers; No unpaid bills; Easy for customers to understand.	Ordering, distribution system must be set up; More plastics in waste stream; Invites possible forgeries, counterfeits.
Prepaid tag or sticker: Customers purchase tags or stickers that are affixed to the waste set out for collection and disposal.	See Prepaid Bag system pros; Also, ordering/distribution is much easier and smaller than with prepaid bags	Difficult to regulate bag size options; Invites possible forgeries, counterfeits.

STEP 8

DETERMINE METHOD OF COLLECTION

The need to maintain high collection rates on tariffs is essential in a normal context, but when contracting with the private sector, collections are crucial to insure timely payments to the operator.

Tariffs, or rates, can be collected from ratepayers in a variety of ways. Figure 3.22 shows a table summarizing a number of these collection methods.

FIGURE 3.22: TARIFF COLLECTION METHODS

Collection Method	Description	Comment
Direct billing	A local government bills ratepayers directly.	Requires establishing and running a billing department. Can be expensive.
Third party billing	Local government contracts with a third party to undertake billing tariffs (e.g., have electricity corporation bill for solid waste collections)	Collection rates can be high. Eases administrative burden of having to set up a direct billing department. Can be expensive.
Pre-paid billing	Households and businesses purchase bags or other "official" containers to use in solid waste disposal.	Insures high collection rates. Establishes a more equitable variable rate system. Can be burdensome and expensive to set up system. System may be circumvented by many users.
Tax rolls	Property taxes are raised to cover solid waste costs.	Inexpensive. Collection rates can be low. Expensive and time-consuming to enforce.

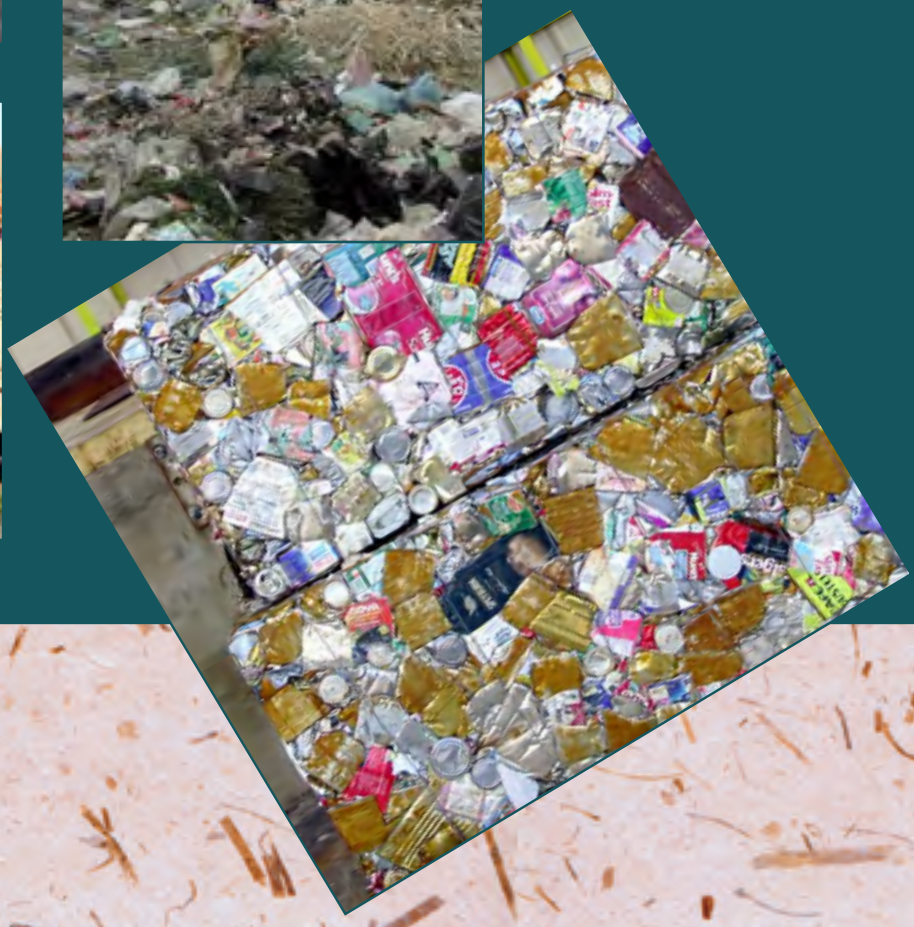
In Alexandria, tariffs for waste collection service are added to electricity bills. This ensures high payment rates, as customers will almost always find ways of paying their electricity bills. This type of billing is arranged with the electricity corporation, which usually charges a fee for its services.

As mentioned previously, "pay as you throw" systems ensure payment from large commercial/industrial waste producers because non-payment of a bill can bring a business to a halt and begin affecting revenue flows.

A Governorate must stay vigilant with respect to tariff setting and collections in order to maintain consistently high revenue flow. Simply relying on a third party collection agent (such as the electricity corporation) to handle all collections does not absolve the Governorate from exercising due diligence in record keeping and analysis. The tasks of collecting data, analyzing the data, setting rates and collecting are a recurring theme. Governorates should strive to achieve the following standards with respect to their SWM systems:

- Maintain operational/demographic/income data on service areas.
- Update willingness to pay survey data.
- Strive to achieve more of a variable rate tariff system in the interest of equity and waste reduction.
- Emphasize public awareness programs—an informed public is one more willing to pay for services.
- Establish good accounting practices. Good accounting is necessary for effective financial management of solid waste management programs. It lays the foundation for all subsequent steps in the process of capital budgeting, collecting operational data, and allows for an honest analysis of the data. In return, the data generated from the process will allow a Governorate to set adequate and appropriate tariffs.

Solid Waste Technical Assistance



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